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On the Impact of Foreign Aid in Education on Growth: How Relevant is the Heterogeneity of Aid Flows and the Heterogeneity of Aid Recipients?*

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Abstract

This paper examines whether foreign aid in education has a significant effect on growth. We take into consideration the heterogeneous nature of aid as well as the heterogeneity of aid recipients—we disaggregate the aid data into primary, secondary and higher education, and run separate regressions for low income and middle income countries. We find that the effect of aid varies by income as well as by the type of aid. Thus our results underscore the importance of the heterogeneity of aid flows as well as the heterogeneity of recipient countries when analyzing the effect of aid on growth.

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"We [the United Nations]…resolve to ensure that by the year 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling and that girls and boys will have equal access to all levels of education…"

United Nations Millennium Declaration, September 2000.

1. Introduction

The Millennium Declaration adopted by the member states of the United Nations in September 2000, identified eight Millennium Development Goals (MDGs) that had to be achieved by the year 2015. A summary of the MDGs are: (i) eradicating poverty and hunger; (ii) achieving universal primary education; (iii) promoting gender equality; (iv) reducing child mortality; (v) improving maternal health; (vi) combating HIV/AIDS and other diseases; (vii) promoting environmental sustainability; and (viii) developing a global partnership for development. Clearly most countries will need substantial amounts of foreign aid in order to achieve the MDGs. For example, Kakwani and Son (2006) document that the average per capita aid to Cameroon from 1990-2002 was $56. However, Cameroon needs about $365 per capita in aid in order to meet the millennium goal, implying that foreign aid per capita to Cameroon will have to increase by over 500 percent for the country to achieve the MDGs. Not surprisingly, the adoption of the MDGs has revived the debate about the effectiveness of foreign aid, in particular whether foreign aid promotes economic growth.

This paper contributes to the discussion on the effectiveness of aid by focusing on the second MDG — i.e., the provision of universal primary education. Specifically we test the (intuitive) hypothesis: *does foreign aid in education enhance economic growth*? This question

although important has not been addressed in the literature.[1] Indeed, aid in education has increased substantially over the past decade. For example, over the period 1993-96 to 2002-2004 the average annual aid in education from the Development Assistance Committee (DAC) member countries increased from $2.5 million to $25.5 million — an increase of over 1,322 percent (OECD, 2006).[2] In addition, over the same period, aid in education as a share of total aid increased from about 1.1 percent to about 9.3 percent (OECD, 2006). It is therefore important to analyze whether the increased aid has had any effect on growth in recipient countries.

With regards to the literature, we note that a large number of papers have examined the effect of foreign aid on growth.[3] However, many of the studies do not take into account the *heterogeneity of aid recipients*. Specifically, data from low and middle income countries are pooled together and the estimated relationships are assumed to be the same for countries in both income groups. This is problematic because as we find in our regressions, the effect of education aid on growth is different for the two income groups.[4] Another limitation of the aid-growth literature is that most of the studies employ aggregate data on aid and therefore do not take into account the *heterogeneous nature of aid*.[5] Again, this is problematic because intuitively, one would expect different types of aid (e.g., education aid, food aid and military aid, etc), to have

[1] A few studies have examined the effect of education aid on more specific outcomes, such as educational attainment and enrollment (e.g., Dreher et al., 2006; Michaelowa and Weber, 2006). See Dreher et al., (2006) for a detailed discussion.

[2] There are 22 DAC members: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and the United States.

[3] Some studies find a positive effect (e.g., Hansen and Tarp, 2001; Clemens et al., 2004), some conclude that there is no robust relationship between aid and growth (e.g., Easterly et al., 2004; Rajan and Subramanian, 2005) and others find that the effect of aid is conditional on some characteristic of the recipient country, such as the country's policy environment (e.g., Burnside and Dollar, 2000), institutional quality (e.g., Burnside and Dollar, 2004) or geographical location (e.g., Dalgaard et al., 2004; Roodman, 2004). For a recent survey of the literature, see Clemens e al. (2004) and Harms and Lutz (2004).

[4] Gomanee et al. (2003) examine the effect of aid on poverty alleviation and conclude that the impact of aid varies by the level of development and that aid is more effective in poorer countries.

[5] The studies that take into account the heterogeneity of aid generally focus on the difference between project and program aid, multilateral and bilateral aid, and grants versus loans (e.g., Mavrotas, 2005; Odedokun, 2004; Ram, 2003). See Mavrotas (2005) for a detailed discussion.

different effects on growth.[6] Another caveat of using aggregate data is that the analyses have limited policy implications. Specifically, the analysis precludes one from identifying the types of aid that enhance growth. Such information is crucial to donors since it helps determine which sectors to allocate aid to.[7] We are aware of only two studies that have employed (disaggregated) sectoral data to examine the effect of aid on growth—Clemens et al. (2004) and Rajan and Subramanian (2005). These studies although an improvement over previous studies have one important caveat: the data on aid used in the regressions are based on *commitments* by donors to recipient countries and not based on the amounts of aid *disbursed*.

This paper extends the existing studies in two important ways. First, to the best of our knowledge this is the first study that utilizes sectoral data on aid *disbursements* to examine the relationship between foreign aid and growth. Second, we take into consideration the heterogeneous nature of aid as well as the heterogeneity of aid recipients. Specifically, we disaggregate the aid data into primary, secondary and higher education, and analyze the effect of each component of education aid on growth for low income and middle income countries. Thus, by quantifying the growth effects of aid in education, the paper provides some guidance to donors on how to effectively allocate aid.

Three important questions emerge from the above discussions: (i) How and why does education aid affect growth? (ii) Why should aid for different levels of education (primary, secondary and higher) have a different impact on growth?; and (iii) Why should the impact of education aid in a middle income country be different from that of a low income country? To

[6] Harms and Lutz (2004) and Clemens et al. (2004) assert that not taking into account the heterogeneity of aid flows may explain the lack of robustness of the effect of aid on growth.

[7] The donor communities have in the past few years increased their resolve to provide more aid to poor countries. For example the call for more aid is the United Nations Millennium Declaration where member states resolved "to grant more generous development assistance" to poor countries. Indeed, aid to developing countries has increased. Thus, given the resolve of the donor community to increase aid to developing countries, the relevant issue for donors is not whether to provide assistance to poor countries, but rather, how aid can be allocated so that it will be growth enhancing.

answer these questions we draw from the education-growth literature. We also draw from the empirical literature that examine the effect of education aid on enrollment rates.

The new endogenous growth and augmented Solow models stipulate a positive relationship between education and growth (e.g., Nelson and Phelps, 1966; Lucas, 1988; Romer, 1990; Mankiw et al. 1992). Also, several empirical studies have found that the stock of human capital and the level of investment in education are positively associated with growth (e.g., McMahon, 1998, Keller, 2006).[8] In answering question (i) we argue that education aid affects growth because it raises the stocks of human capital and also increases investment in education in recipient countries. Our assumption that education aid enhances human capital accumulation is not unreasonable. First note that by supplementing the educational budget of the government, aid can increase investment in education in recipient countries. Furthermore, by providing resources to finance education (e.g., build schools, hire and train teachers, free textbooks and other school supplies for pupils), education aid can improve the quality of education in recipient countries. Indeed, anecdotal evidence from several countries suggests that aid in education reduces absenteeism and boosts enrollment and retention rates.[9] The positive association between education aid and enrollment rates is also consistent with the empirical findings of Michaelowa and Weber (2006) and Dreher et al., (2006).

In answering questions (ii) and (iii), we note that education can enhance economic growth through several channels such as increasing productivity and technological progress, facilitating technological spillovers and the diffusion of knowledge, reducing the effect of

[8] See Krueger and Lindahl (2001) for a review of the literature.
[9] For example in January 2006, Ghana started implementing the NEPAD School feeding program— a program funded by foreign aid which provides "each primary school child, with a decent nutritious and well balanced meal a day on each school attendance day." Initial results indicate that enrollment has more than doubled and absenteeism has declined substantially since the inception of the program. For more information see http://ghanadistricts.com/home/?_=14&sa=3019&PHPSESSID=5fdfd1c6be03c4b136f4e7d89f6e9504.

diminishing return to physical capital and improving health outcomes, such as lowering fertility and mortality rates (Nelson and Phelps, 1966; Lucas, 1988; Romer, 1990; Mankiw et al. 1992; Appiah and McMahon, 2002). Clearly, the mechanism by which education affects growth will be different for the three stages of education. [10] As a consequence, one would expect different stages of education to exhibit different growth effects. Another important point is that the contribution of labor to growth depends on the availability of complementary inputs such as physical capital and technological know-how. Clearly, the availability of complementary inputs vary by the level of development—suggesting that the growth effects of education will be different for low and middle income countries. Finally, we note that several empirical studies have found that the growth enhancing effect of education is different for the three stages of education and also varies by the level of development (e.g., Petrakis and Stamatakis, 2002; Keller 2006). Petrakis and Stamatakis (2002) take a more formal approach by constructing and estimating an endogenous growth model that allows the effects of education to vary by the stage of education as well as the level of development.[11] They find that the differences in growth effects are statistically significant: overall primary and secondary education are more relevant for growth in less developed countries while higher education is more pertinent in developed countries.

Our analysis covers 90 developing countries over the period 1990-2004 and we use the dynamic panel estimator proposed by Arellano and Bond (1991) and Blundell and Bond (1998) for our estimations. We first run regressions where we pool data from low income and middle

[10] For example, the decline in fertility and mortality rates as a channel by which education affects growth is more relevant for primary education whereas technological spillovers is a more pertinent transmission mechanism for higher education.

[11] They consider three groups of countries—Advanced OECD countries, Developed OECD countries and less developed countries and test two hypothesis: (i) whether the growth effects of each stage of education differs significantly *within* each country group; and (ii) whether the growth effect of each stage of education differs significantly *across* the three country groups.

income countries. We find that none of the measures of education aid (aggregate, primary, secondary and higher education) have a significant effect on growth. We get different results when we disaggregate the data by income. For low income countries, aid in primary education has a positive and significant effect on growth but aid in post-primary education does not have a significant effect. For middle income countries, aid in higher education has a positive and significant effect on growth. In contrast, aid in primary education and secondary education has an adverse effect. These results underscore the importance of taking into consideration the heterogeneity of aid flows as well as the heterogeneity of the recipient countries when analyzing the effect of aid on growth.

The rest of the paper is organized as follows. Section 2 provides a brief review of the literature that is related to our work and Section 3 describes the data and the variables included in the regressions. Section 4 presents the empirical results and Section 5 concludes.

2. Brief Review of Related Literature

As pointed out earlier, most of the studies that examine the effect of aid on growth employ *aggregate* data on aid. We found only two papers, Clemens et al. (2004) and Rajan and Subramanian (2005), that are closely related to our work in that they use aid data disaggregated by sector. Clemens et al. (2004) disaggregate aid into three components: (i) emergency and humanitarian aid; (ii) short-impact_aid, defined as aid that stimulates growth within 4 years (includes budget support, infrastructure, banking, agricultural and industry); and (iii) long-impact_aid, which refers to aid that affect growth over the long-term (includes technical assistance, democracy, environment, health, education). Their analysis focuses on short-term_aid and they find that short-term_aid has a positive and robust effect on growth. They assert that using aggregate data and thereby disregarding the heterogeneity of aid may explain the

insignificant effect of aid on growth found in previous studies. This view is challenged by Rajan and Subramanian (2005). The authors analyze the effect of short-term_aid as well as long-term_aid, economic_aid, social_aid and food_aid on growth, and conclude that none of these types of aid has a robust effect on growth.[12] Both studies have two limitations. First, the studies employ data on aid *commitment* (i.e., commitments by donors to recipient countries), probably because data on aid *disbursement* are not readily available at the sectoral level. This is problematic for several reasons. Note that not all commitments made to countries are honored by donors. Even when commitments are honored, the funds are typically disbursed over several years. For example, the Canadian International Development Agency (CIDA) committed in 1997 to finance an education project in Bangladesh. However the funds were disbursed over a 7 year period, from 1998 to 2004.[13] The issue of the mismatch between the periods of commitment and disbursement is particularly relevant when the empirical analysis employs data on aid commitment averaged over four or five years, as in Clemens et al. (2004) and Rajan and Subramanian (2005). Thus if the amounts of aid commitments differ significantly from the amounts disbursed, or the years between commitment and disbursement are fairly long, then it will be inappropriate to use data on aid commitment to analyze the effect of aid on growth. The second caveat of the two studies is that although the level of disaggregation is an improvement over previous efforts, the sectors considered are still broad and therefore the problem of aggregation bias remains a concern. Furthermore, the analysis has little policy relevance because lumping together many sectors provides donors with little guidance as to which sector to fund.

[12] Social_aid includes aid in education, health, population programs, government and civil society, water supply and sanitation; and economic_aid includes aid in transport and storage, communications, energy and financial services.
[13] The break down of the amount disbursed in thousands of dollars is as follows: $0 in 1997, $433.43 in 1998, $512.29 in 1999, $880.08 in 2000, $619.11 in 2001, $642.04 in 2002, $139.96 in 2003 and $22.29 in 2004 (OECD, 2006).

This paper addresses these two limitations by using data on aid *disbursement* and also focusing on a specific sector, *education*.

Our work is also related to the voluminous literature on the determinants of growth. Specifically, we draw from the literature that analyzes the robustness of the explanatory variables often included in growth regressions. In their influential paper, Levine and Renelt (1992: 943) noted that "… the cross-country statistical relationships between long-run average growth rates and almost every particular policy indicator considered by the profession are fragile: small alterations in the "other" explanatory variables overturn past results." They concluded that the most robust determinant of growth is the ratio of investment to GDP. Rodrik et al. (2004) found that institutional quality has a more robust effect on growth than geography and openness to trade. Specifically, they found that once institutions are controlled for, measures of geography and openness to trade cease to have a significant effect on growth. In a recent paper, Doppelhofer et al. (2004) provided rankings based on the robustness of 32 explanatory variables often included in growth regressions. The log of initial GDP per capita ranked first among all the variables. Thus, to ensure that our results are robust, we include the following variables in our regressions as controls: domestic fixed investment as a share of GDP, the log of initial GDP per capita, and the effectiveness of the rule of law as a measure of institutional quality. We also include in our regressions two policy variables—the rate of inflation and government consumption as a share of GDP to capture the policy environment in the recipient country.[14] Our aim is to test whether aid in education has a significant effect on growth after controlling for all these important determinants of growth.

[14] Burnside and Dollar (2000) argue that aid has a positive effect on growth only in countries that have a good policy environment. They considered three measures of good policies: inflation, budget deficits and openness. The data for budget deficit is not available for several of the countries in our sample. We therefore used government consumption in our regressions. Also, similar to Rodrik et. al. (2004), trade/GDP ceased to be significant after controlling for institutional quality. So we excluded trade/GDP, a measure of openness from the estimations.

3. The Data and the Variables

The data on education aid disbursement are from the 5-CRS/Aid Activities-Disbursements database, which is part of the OECD Development Assistance Committee (DAC) Credit Reporting System (CRS).[15] The database has comprehensive information on education projects in developing countries funded by DAC member countries. The data includes information such as the names of the donor and recipient countries, name of the agency implementing the project (includes non-governmental agencies and other agencies such as UNICEF, EC), a description of the project (teacher training, equipment), starting and ending dates of the project, the level of education being funded (primary, secondary or higher), the type of aid (grants or loans), the amount committed by the donor, the year of commitment and the amount of funds disbursed each year. The data are available from 1990-2004. Based on the data, we constructed our variable of interest, which is the amount of aid disbursed to each recipient country every year.[16]

We point out two caveats of the aid data. First, the years of coverage is short—the data is available for only 15 years.[17] Second, the data does not capture all the education aid flows to the various recipient countries—the database does not have data on aid from non-DAC countries and important multilateral agencies such as the World Bank.[18] We however note that aid from DAC countries constitute over 85 % of official assistance to developing countries. For example, the breakdown of the gross official aid to developing countries in 2004 was 89.7 percent for DAC

[15] The data are available at http://www.oecd.org/dataoecd/50/15/5037782.htm.
[16] Thus, for each year, we calculated the sum of aid disbursements from all the DAC members to each of the recipient countries.
[17] Specifically, the data on education aid disbursements are not available prior to 1990.
[18] To the best of our knowledge, data on education aid for non-DAC countries and multilateral agencies such as the World Bank are not readily available. Also, the total education aid to recipient countries is not readily available either. As a consequence, we are unable to estimate the proportion of education aid that come from DAC countries.

countries, 8.7 percent for multilateral agencies and 1.6 percent for non-DAC countries (OECD, 2006).[19]

With regards to the control variables, the measure of institutional quality reflects the impartiality of the legal system and the extent to which the rule of law is enforced. The data ranges from 0 to 6, a higher rating implies a more impartial legal system. The data are from the *International Country Risk Guide*, published by Political Risk Services.[20] The remaining variables, namely, GDP per capita growth, initial GDP per capita, inflation, investment and government consumption are from the *World Development Indicators* (2005) CD-Rom, published by the World Bank. The analysis covers 90 developing countries; 56 middle income countries and 34 low income countries over the period 1990-2004 and we average the data over three years.[21] The years of coverage and the countries included in the analysis are determined by the availability of data. Table 1 presents the summary statistics of the variables and Table 2 displays the correlations between the various aid variables. The countries included in the analysis are listed in Table 3.

4. Empirical Analysis

4.1. Estimation Procedure

In their seminal paper, Hansen and Tarp (2001) asserted that three factors may cause the estimates from aid regressions to be biased: (i) the joint effect of endogeneity of aid flows; (ii) unobserved country specific factors; and (iii) conditional convergence. The authors recommend using the dynamic panel General Method of Moments (GMM) estimator proposed by Arellano

[19] The amounts are $92.254 million for DAC countries, $8.971 million for multilateral organizations and $1.6 million for non-DAC countries.
[20] See http://www.prsgroup.com/icrg/icrg.html.
[21] The country classifications are from the World Bank and are based on the 2005 GNI per capita, calculated using the World Bank Atlas method. The GNI per capita for low income countries is less than or equal to $875 and that for middle income countries lies in the range$876 - $3,465.

and Bond (1991) to overcome these potential problems. This estimator often referred to as the "difference GMM" estimator uses lagged levels of first difference of variables as instruments. However, as pointed out by Arellano and Bover (1995), lagged levels are often poor instruments for first differences. This problem is mitigated by using the augmented version of the difference GMM estimator, the "system GMM" estimator, proposed by Arellano and Bover (1995) and Blundell and Bond (1998). Specifically, the system GMM combines both the level and first difference equations. Another advantage of the system GMM estimator is that it reduces finite sample bias by exploiting additional moment conditions where the autoregressive parameter is only weakly identified from the first-differenced equation. Since the number of observations of some of our sub-samples is small, we use the system GMM estimator for our regressions.[22] We also note that the estimates from this procedure are inconsistent in the presence of autocorrelation. Hence for each regression we report the test for autocorrelation as well as the test of over-identifying restrictions. For all the regressions, the p-values for the test for autocorrelation and the Hansen-J Statistic confirm the absence of autocorrelation and the validity of the instruments.

Following the aid-growth literature, we estimate the equation:

$$Growth_{it} = \alpha + \beta\ aid/GDP_{it} + \gamma\ Controls_{it} + \varepsilon_{it} \qquad (1)$$

where $Growth_{it}$ is the GDP per capita growth rate of country *i* in period *t*; aid/GDP_{it} is foreign aid in education as a share of GDP (percent); $Controls_{it}$ are the control variables and ε_{it} is the error term. As is standard in aid-growth regressions, we treat the aid variable as endogenous. We also use all the control variables as additional instruments and do not put any restrictions on the number of lags to be used as instruments.

[22] We also run regressions using the difference GMM and the main results were similar.

4.2. Effect of Education_Aid Variables on Growth

In order to highlight the importance of the heterogeneity of aid flows and the heterogeneity of aid recipients, we first report the results where we use aggregate data on aid to estimate the pooled sample and compare with the results where the data is disaggregated by the level of education and income. Tables 4, 5 and 6 show the results for the full sample, low income countries and middle income countries respectively. To facilitate the discussion, we also report a summary of the results in Table 7 where we show only the estimated coefficients of the aid variables.

Column (1) of Table 4 (also see Column (1) and Row (1) of Table 7) shows the estimated coefficients for the regression for the pooled sample where we use data on aggregate education aid — i.e., the analysis ignores the heterogeneity of aid recipients and the heterogeneity of aid flows. Note that the estimated coefficient of aggregate_aid is not significant suggesting that overall, education aid does not have a significant effect on growth for developing countries. We next take into consideration the heterogeneity of aid flows but not the heterogeneity of aid recipients by disaggregating the education aid data into primary, secondary and higher. Columns (2), (3) and (4) of Table 4 report the estimated coefficients for the three stages of education aid (also see Columns (2), (3) and (4) of Row 1 in Table 7). Similar to the regressions using aggregate_aid, the estimated coefficients of primary_aid, secondary_aid and higher_aid are not significant. Thus, based on these results, one may conclude, albeit *erroneously*, that all types of education_aid do not have a significant effect on growth. However, as predicted by the education-growth literature (e.g., Petrakis and Stamatakis, 2002), the results change when we run regressions for the different stages of education aid and different levels of income (see Table 7 or compare Tables 5 and 6). Specifically, Table 7 shows that the estimated coefficient of

primary_aid/GDP is positive and significant at the 1 percent level for low income countries, the estimated coefficient of secondary_aid/GDP is negative and significant only at the 10 percent level and the coefficient of higher_aid/GDP is not significant: all else equal a one standard deviation increase in primary_aid/GDP will increase growth by about 0.316 percent in low income countries. Thus, our results suggest that overall, aid in primary education boosts growth in low income countries but aid in post-primary education does not have a significant impact on growth (see Tables 5 and 7).

For middle income countries, aid in primary and secondary education has a negative and significant impact on growth while aid in higher education has a positive effect. All else equal, a one standard deviation increase in primary_aid/GDP and secondary_aid/GDP will decrease growth by about 0.293 percent and 0.174 percent, respectively. In contrast, a one standard deviation increase in higher_aid/GDP will raise growth by about 0.395 percent (see Tables 6 and 7). A plausible explanation for the adverse effect of primary_aid and secondary_aid on growth in middle income countries is that most of the countries have achieved universal or almost universal primary and secondary education. In addition, in these economies, basic education is less relevant for production. Also, unlike low income countries where most of the aid take the form of grants (i.e., there is no repayment requirement) aid to middle income countries generally take the form of loans. Thus, foreign aid in primary and secondary education to these countries is tantamount to borrowing to fund a project that generates very little socio-economic returns. As a consequence, the overall effect of education aid in primary and secondary education on growth may be negative.

Finally, we note that by including only one measure of education aid at a time in our regressions, our estimations may suffer from the usual omitted variable bias problem. Indeed, in

order to accurately capture the effects of each of the aid variables on growth, the estimations should include all the three measures of education aid. However, this approach will produce inaccurate estimates if there is multicollineariy.[23] That seems to be the case for our data. As shown in Table 2, the correlation coefficients between the aid variables are all significant, most of them at the 1 percent level. Also, in regressions that we included all the three aid variables, the magnitudes of the estimated coefficients of some of the variables increased substantially. We however note that the dynamic panel estimator that we employ for our analysis mitigates the potential omitted variable bias problem.

4.3. The Effect of the Control Variables on Growth

As pointed out earlier, the objective of this paper is to examine the effect of education aid on growth, and not to explain the determinants of growth. Therefore, in order to keep the paper focused, we'll discuss only the overall effect of the control variables. Our results support the assertion by Levine and Renelt (1992) that domestic investment has a robust and positive effect on GDP per capita growth—the estimated coefficient of investment is significant at the 1 percent level in all the 12 regressions reported in Tables 4, 5, and 6. Our results are also consistent with that of Rodrik et. al. (2004) who concluded that institutions are important for growth: the estimated coefficient of law and order is positive and significant at the 1 percent level in 10 regressions, at the 5 percent level in one regression and at the 10 percent level in one regression. Overall, our results do not support the assertions of Doppelhofer et al. (2004): the estimated coefficient of the log of initial GDP per capita is not significant in 6 regressions, negative and significant at the 10 percent level in 4 regressions and negative and significant at the 1 percent

[23] See Leoning (2005) for a discussion of the collinearity problems associated with the variables that measure the various stages of education.

level in only two regressions. The policy variables performed quite well: inflation is negative and significant at the 1 percent level in 11 regressions and at the 5 percent level in one regression; government consumption is negative and significant at the 1 percent level in 9 regressions and at the 5 percent level in 3 regressions. We also considered other variables used in previous studies, such as M2/GDP, as a measure of financial depth; the number of coups and assassinations as a measure of political instability; a measure of ethnic diversity and the share of trade/GDP as a measure of openness to trade. However, none of the variables displayed a consistent effect on growth after controlling for institutional quality, domestic investment, inflation and government consumption.

5. Conclusion

This paper has examined the effect of education aid on growth. We find that the effect of aid depends on the level of development of the recipient country (low and middle income) as well as the level of education at which aid is being targeted (primary, secondary or higher). Aid in primary education enhances growth in low income countries but aid in post-primary education has no significant effect. For middle income countries, aid in primary education and secondary education has an adverse effect on growth but aid in higher education enhances growth. Thus, our results highlight the importance of taking into account the heterogeneity of aid and the heterogeneity of the recipient countries when analyzing aid-growth relationships. With regards to policy, out results suggest that increased aid in primary education to poor countries will provide double dividends: promote economic growth and also help the countries to achieve the millennium development goal of universal primary education.

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Table 1

Summary Statistics

Variable	Full Sample		Middle Income Countries		Low Income Countries	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
GDP per Capita Growth	1.498	3.656	2.171	3.623	0.438	3.463
Aggregate Education Aid/GDP (%)	0.101	0.228	0.040	0.099	0.196	0.323
Primary Education Aid/GDP (%)	0.048	0.131	0.012	0.044	0.106	0.189
Secondary Education Aid/GDP (%)	0.013	0.040	0.010	0.043	0.018	0.033
Tertiary Education Aid/GDP (%)	0.039	0.122	0.019	0.050	0.072	0.180
Rule of Law	3.319	1.194	3.592	1.190	2.889	1.072
Fixed Investment/GDP (%)	20.797	6.304	22.428	5.779	18.227	6.256
Log (Initial GDP per Capita)	8.001	0.880	8.595	0.454	7.066	0.487
Log (Inflation)	4.224	0.579	4.214	0.502	4.241	0.684
Government Consumption/GDP (%)	14.127	5.372	14.844	5.734	12.997	4.539

Table 2

Correlations between Education Aid Variables

Education_Aid Variable	Full Sample		Middle Income Countries		Low Income Countries	
	Primary	Secondary	Primary	Secondary	Primary	Secondary
Secondary	.4091*** (.000)		0.553*** (0.000)		0.538*** (0.000)	
Higher	.3639*** (.000)	.2968*** (.000)	0.157** (0.013)	0.166** (0.008)	0.332*** (0.000)	0.485*** (0.000)

Notes: P-values in parentheses. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

Table 3
List of Countries in the Sample

Middle Income Countries		Low Income Countries
Albania	Jordan	Bangladesh
Algeria	Kazakhstan	Burkina Faso
Argentina	Latvia	Cameroon
Armenia	Lithuania	Congo, Dem. Rep.
Azerbaijan	Malaysia	Congo, Rep.
Belarus	Mexico	Cote d'Ivoire
Bolivia	Morocco	Ethiopia
Botswana	Namibia	Gambia
Brazil	Panama	Ghana
Bulgaria	Paraguay	Guinea-Bissau
Chile	Peru	Haiti
China	Philippines	India
Colombia	Poland	Kenya
Costa Rica	Romania	Madagascar
Croatia	Russian Federation	Malawi
Czech Republic	Saudi Arabia	Mali
Dominican Republic	Slovak Republic	Moldova
Ecuador	South Africa	Mongolia
Egypt, Arab Rep.	Sri Lanka	Mozambique
El Salvador	Syrian Arab Republic	Nicaragua
Estonia	Thailand	Niger
Gabon	Trinidad and Tobago	Nigeria
Grenada	Tunisia	Pakistan
Guyana	Turkey	Papua New Guinea
Honduras	Ukraine	Senegal
Hungary	Uruguay	Sierra Leone
Indonesia	Venezuela, RB	Sudan
Iran, Islamic Rep.		Tanzania
Jamaica		Togo
Jordan		Uganda
		Vietnam
		Yemen, Rep.
		Zambia
		Zimbabwe

Table 4

Effect of Education Aid on Growth for the Pooled Sample

Variables	Aggregate (1)	Primary (2)	Secondary (3)	Higher (4)
Aid Variables				
Aggregate Education Aid/GDP (%)	0.082			
	(0.797)			
Primary Education Aid/GDP (%)		0.967		
		(0.129)		
Secondary Education Aid/GDP (%)			-1.320	
			(0.609)	
Higher Education Aid/GDP (%)				0.299
				(0.736)
Control Variables				
Rule of Law	0.675***	0.715***	0.631***	0.629***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Investment/GDP (%)	0.184***	0.170***	0.158***	0.181***
	(0.000)	(0.000)	(0.000)	(0.000)
Log (Initial GDP per Capita)	-0.001	0.087	0.157	0.087
	(0.994)	(0.637)	(0.271)	(0.636)
Log (Inflation)	-1.715***	-1.421***	-1.834***	-1.623***
	(0.000)	(0.000)	(0.000)	(0.000)
Government Consumption/GDP (%)	-0.118***	-0.112***	-0.125***	-0.107***
	(0.109)	(0.002)	(0.289)	(0.000)
Constant	4.413**	2.493	4.369**	3.206
	(0.038)	(0.251)	(0.034)	(0.114)
Number of Observations	407	407	407	407
Number of Countries	90	90	90	90
Hansen J- Statistic[1]	0.503	0.192	0.545	0.472
Test for Autocorrelation[2]	0.302	0.262	0.335	0.311

Notes: P-values in parentheses. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is that the error terms in the first difference regression exhibit no second order serial correlation.

Table 5

Effect of Education Aid on Growth for Low Income Countries

Variables	Aggregate (1)	Primary (2)	Secondary (3)	Higher (4)
Aid Variables				
Aggregate Education Aid/GDP (%)	0.514*			
	(0.065)			
Primary Education Aid/GDP (%)		1.674***		
		(0.001)		
Secondary Education Aid/GDP (%)			-6.070*	
			(0.051)	
Higher Education Aid/GDP (%)				0.210
				(0.642)
Control Variables				
Rule of Law	0.901***	1.033***	0.853***	0.927***
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Investment/GDP (%)	0.169***	0.194***	0.172***	0.202***
	(0.000)	(0.000)	(0.000)	(0.000)
Log (Initial GDP per Capita)	-0.252	-0.676*	-0.631	-0.719***
	(0.456)	(0.054)	(0.107)	(0.009)
Log (Inflation)	-1.315***	-1.348***	-0.941***	-1.233***
	(0.000)	(0.000)	(0.002)	(0.000)
Government Consumption/GDP (%)	-0.153***	-0.131***	-0.152***	-0.173***
	(0.003)	(0.004)	(0.000)	(0.003)
Constant	4.084	6.055***	5.579*	6.650***
	(0.121)	(0.003)	(0.088)	(0.007)
Number of Observations	158	158	158	158
Number of Countries	34	34	34	34
Hansen J- Statistic[1]	0.619	0.501	0.500	0.788
Test for Autocorrelation[2]	0.773	0.881	0.878	0.865

Notes: P-values in parentheses. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is that the error terms in the first difference regression exhibit no second order serial correlation.

Table 6

Effect of Education Aid on Growth for Middle Income Countries

Variables	Aggregate (1)	Primary (2)	Secondary (3)	Higher (4)
Aid Variables				
Aggregate Education Aid/GDP (%)	0.210			
	(0.736)			
Primary Education Aid/GDP (%)		-6.599***		
		(0.000)		
Secondary Education Aid/GDP (%)			-4.022**	
			(0.017)	
Higher Education Aid/GDP (%)				7.938***
				(0.007)
Control Variables				
Rule of Law	0.296*	0.278**	0.469***	0.504***
	(0.091)	(0.010)	(0.000)	(0.002)
Fixed Investment/GDP (%)	0.175***	0.147***	0.137***	0.142***
	(0.000)	(0.000)	(0.000)	(0.000)
Log (Initial GDP per Capita)	-0.818*	-1.101***	-0.837*	-0.946*
	(0.099)	(0.004)	(0.085)	(0.052)
Log (Inflation)	-1.401**	-2.029***	-2.339***	-1.795***
	(0.022)	(0.003)	(0.001)	(0.004)
Government Consumption/GDP (%)	-0.078**	-0.071**	-0.088***	-0.078***
	(0.018)	(0.032)	(0.006)	(0.005)
Constant	11.358**	17.002***	16.010***	13.905***
	(0.012)	(0.000)	(0.003)	(0.009)
Number of Observations	249	249	249	249
Number of Countries	56	56	56	56
Hansen J- Statistic[1]	0.450	0.382	0.246	0.421
Test for Autocorrelation[2]	0.089	0.087	0.078	0.100

Notes: P-values in parentheses. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

[1] The null hypothesis is that the instruments are not correlated with the residuals.

[2] The null hypothesis is that the error terms in the first difference regression exhibit no second order serial correlation.

Table 7
Effect of Education Aid on Growth: Summary Results

Sample	Aggregate_Aid	Primary_Aid	Secondary_Aid	Higher_Aid
Pooled Sample	0.082 (0.797)	0.967 (0.129)	-1.320 (0.609)	0.299 (0.736)
Low Income	0.514* (0.065)	1.674*** (0.001)	-6.070* (0.051)	0.210 (0.642)
Middle Income	0.210 (0.736)	-6.599*** (0.000)	-4.022** (0.017)	7.938*** (0.007)